ME-8352

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MODEL 41-01
TRANSMISSION TEST SET

OPERATING MANUAL

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HLI® HEKIMIAN LABORATORIES, INC.

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OPERATING MANUAL
MODEL 41-01
TRANSMISSION TEST SET

Manufactured by

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SECTION 1.0
INTRODUCTION

1.1 General Description

The Model 41-01 TRANSMISSION TEST SET combines the functions of level, noise and frequency measurements with a flexible signal generator in a compact, rack mounted instrument designed to fill a variety of fixed plant requirements. Small enough to be added to existing bays and inexpensive enough to replace or augment congested centralized test facilities, it sets a high level of reliability, accuracy and operating convenience.

Dual digital displays simultaneously present fully autoranged level/noise measurements with frequency readings from 40 Hz to 20 kHz. Indicating pushbutton controls are arranged for ease of operation and all variable controls have excellent resolution and setability. Independent selection of receive and send impedances and an audio monitor add to the unit's flexibility.

Level measurements are made directly in dBm using an average type detector in compliance with Bell System Standards.

Noise measurements are made directly in dBrn using a quasi-RMS detector. C-message and 3 kHz flat weighting filters are front panel selected along with a 1010 Hz notch filter which meets the revised (1975) Bell System Standards.

Frequency is measured on the second display and provides a dual range 4-digit readout in kHz with 1 or 10 Hz resolution.

The flexible signal generator features continuous and stepped frequency coverage. For noise measurements, both a low distortion, crystal-controlled 1004 Hz holding tone and a quiet termination are provided. To achieve high resolution and setability, the frequency and level controls are true 10-turn instrument potentiometers.

The Model 41-01 is powered by a self-contained power supply which draws 15 watts from either the commercial ac power line or a -24 V dc station battery. The test set is optionally available for a -48 V dc station battery. The power cord and fuse are located on the rear panel of the instrument.

1.2 Specifications

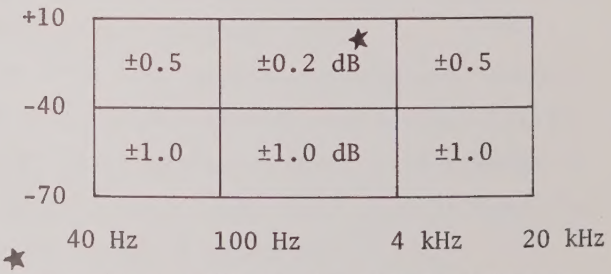
The electrical and mechanical specifications for the Model 41-01 are listed in Table 1-1.

A photograph of the Model 41-01 is shown in Figure 1-1.

TABLE 1-1

SPECIFICATIONS

GENERAL	
Measurements	Level (dBm), noise (dBrn), frequency (kHz)
Displays	Dual display, level or noise, and frequency
Generator	Sine wave, fixed and variable frequency, variable level
Monitor Speaker	Front panel volume control
INPUT	
Impedance	600 Ω, 900 Ω, or bridged
Return Loss	>30 dB, 200 Hz to 20 kHz
Balance	>60 dB, up to 4 kHz
Line Holding	Resistive termination, 3 watts maximum
LEVEL MEASUREMENT	
Frequency Range	40 Hz to 20 kHz
Measurement Range	-80.0 dBm to +10.0 dBm full autoranging
Accuracy	dBm



★ ±0.1 dB at 1000 Hz for levels between 0 and -19 dBm

Detector Type	Average

TABLE 1-1 (cont.)

NOISE MEASUREMENT	
Weighting Filters (Ref. Bell PUB 41009)	C-Message 3 kHz flat 1010 Hz notch filter
Measurement Range	+10 dBrn to +100 dBrn, full autoranging
Accuracy	±1.0 dB, +20 dBrn to +100 dBrn
Detector Type	Quasi-RMS
FREQUENCY MEASUREMENT	
Frequency Range	40 Hz to 20 kHz
Level Range	-40 dBm to +10 dBm
Resolution/Update	1 Hz/2 times per second 10 Hz/10 times per second
Accuracy	±1 count
GENERATOR	
Frequency Range	200 Hz to 20 kHz
Modes	Continuous 100.4 Hz step* 1004 Hz Off (quiet termination)
Level Range	-40 dBm to +10 dBm continuously adjustable
Distortion	>60 dB, 1004 Hz fixed >50 dB, 200 Hz to 4000 Hz >40 dB, 4000 Hz to 20 kHz
Impedance	600 Ω, 900 Ω (balanced)
Return Loss	>30 dB, 200 Hz to 4000 Hz
CONNECTORS	
Front Panel	5-way binding posts, 310 jack*
Rear Panel	Screw-type barrier strip
POWER	100-130 V ac, 47-63 Hz, 15 watts or -24 V dc @ 600 ma*
SIZE	19" (48.26 cm.) W x 1-3/4" (4.45 cm.) H x 14-1/8" (35.88 cm.) D
WEIGHT	8.2 lbs. (3.7 kg.)

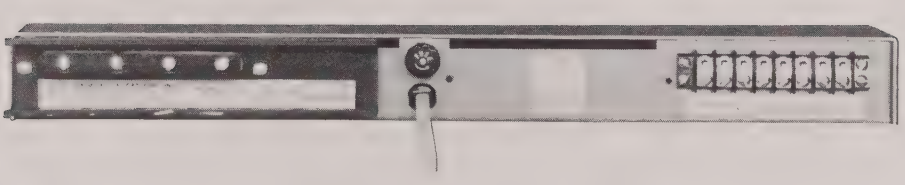
*See Option List

TABLE 1-1 (cont.)

OPTIONS	-1. 220 V ac operation
	-11. -48 V dc operation
	-12. Optional input connectors
	-14. 100 Hz steps in place of 100.4 Hz
	-15. 23" rack mounting
	-16. REMOTE display unit

HLI reserves the right to make changes in specifications at any time without notice.

FRONT VIEW



REAR VIEW

FIGURE 1-1. MODEL 41-01 TRANSMISSION TEST SET

SECTION 2.0
INSTALLATION

2.1 General

The Model 41-01 TRANSMISSION TEST SET is designed for ease of operation and installation. After the unit has been removed from its shipping container, perform a complete visual inspection for possible damage. If damage is found, notify the carrier immediately; do not destroy any packing material until an agent of the carrier has examined it. Under U.S. shipping regulations, damage claims must be collected by the consignee; do not return the instrument to Hekimian Laboratories, Inc., until a claim for damages has been established.

To inspect the unit's interior, remove the screws along the sides of the unit. These hold the top cover which may then be removed and complete visual inspection may be performed.

All internal adjustments have been set at the factory and no further adjustments are required prior to installation or use of the equipment.

2.2 Unit Installation

Power for the unit is supplied either from the ac power line via the line cord or from a -24 V dc (-48 V dc optional) station battery through the rear panel barrier strip. The line cord must be disconnected when the unit is operated on station battery. Check power supply polarity carefully. A reverse polarity may cause severe damage to the Model 41-01 power supply. The positive terminal of the -24 V input is connected to the chassis. Use only a floating 24 V supply or a positive ground supply.

Signal receive/send lines are connected to the front panel Western Electric 310 jacks, 5-way binding posts, or the rear panel barrier strip. Shielded cable is recommended for all signal connections. Ground connections for terminating cable shields are provided on the barrier strip.

Figure 2-1 shows overall mounting and dimensional data for the Model 41-01. Alternate mounting locations of the rack adapter ears are shown and may also be used for the optional rack adapters. When rack mounting is not desired, the ears may be completely removed.

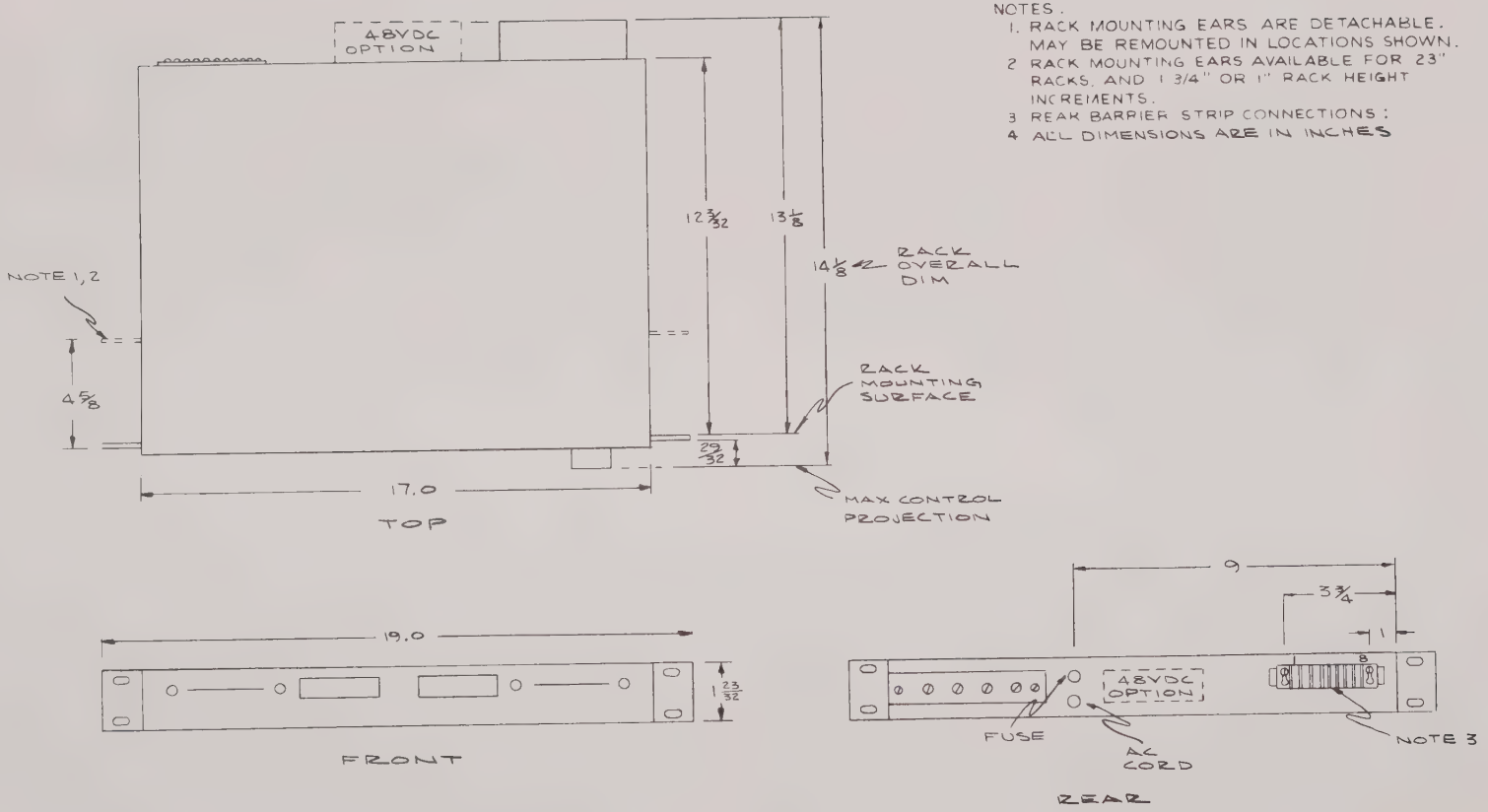


FIGURE 2-1. MODEL 41-01 INSTALLATION DIMENSIONS

SECTION 3.0
OPERATION

3.1 General

This section contains a description of the controls and indicators, operation procedures, and methods of measurement to be used with the Model 41-01. Prior to operation, be sure that all connections to the instrument are made in accordance with instructions in Section 2.0.

3.2 Functional Description

The Model 41-01 block diagram is shown in Figure 3-1. Signal flow is from left to right. The generator section consists of a 1004 Hz test tone and a continuously variable oscillator which may be stepped at 100.4 Hz intervals. The desired mode of operation is selected by the front panel pushbutton switches. The desired signal is then fed to the send amplifier whose amplitude is controlled by the front panel generator LEVEL control.

The receiver can be selected to measure either level or noise, with or without holding tone. When a desired mode has been selected, the signal is then fed to the autorange amplifier, detectors and digital voltmeter. Connections are also made to the frequency counter and audio monitor amplifier.

The master clock is a crystal-controlled 2 MHz oscillator from which all other timing pulses are derived. This oscillator is also used to derive the fixed 1004 Hz test tone.

3.3 Controls and Indicators

The controls and indicators used to operate the Model 41-01 are described in Table 3-1. All controls are located on the front panel and are shown in Figure 1-1. Internal adjustments are not required.

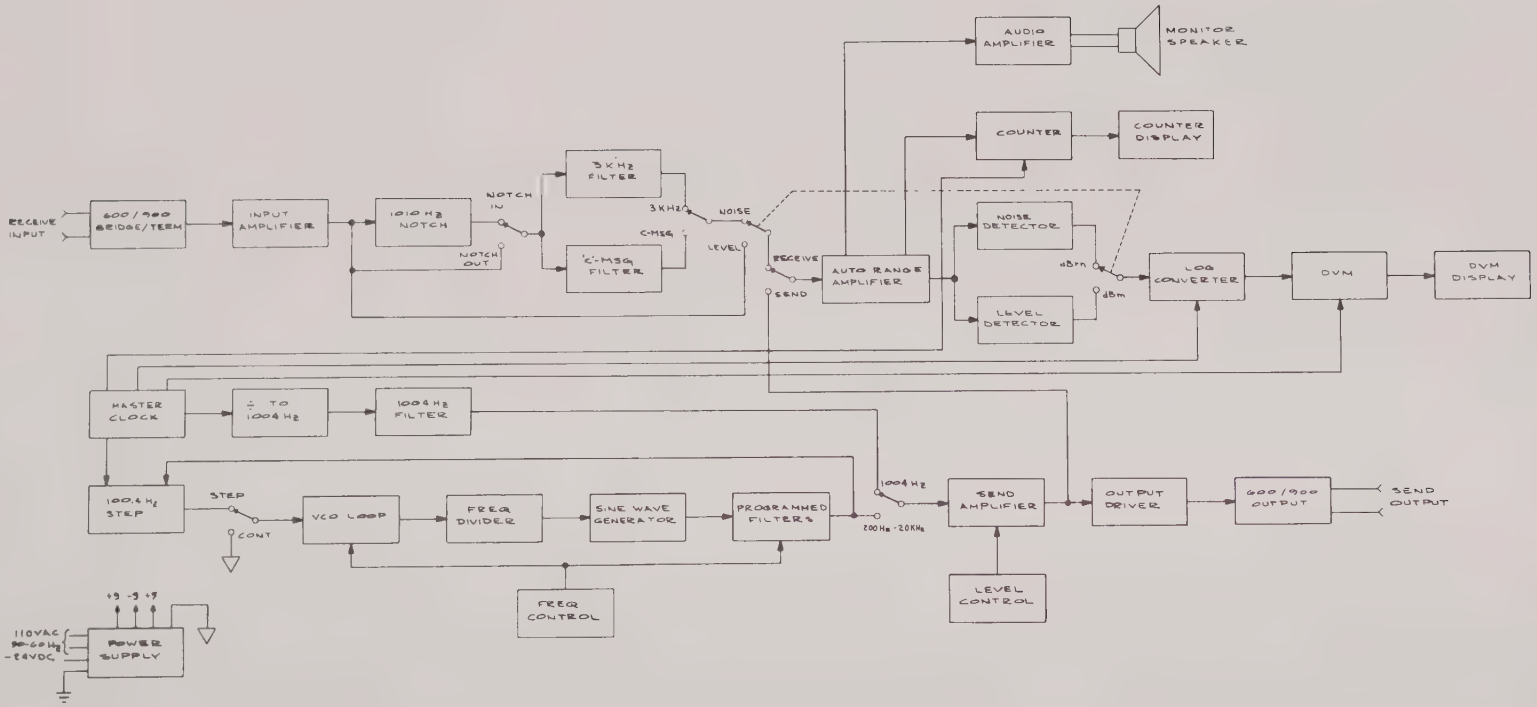


FIGURE 3-1. MODEL 41-01 BLOCK DIAGRAM

TABLE 3-1

CONTROLS AND INDICATORS

Designation	Function
RECEIVE Pushbutton Switches	Selects either 600 Ω or 900 Ω impedance, terminated or bridged modes and sets the dBm reference impedance for the input.
DISPLAYS Pushbutton Switches	Selects either the receive or send signals to be monitored and displayed on the level meter and frequency counter.
DBRN Pushbutton Switches	Selects either the C-Message or 3 kHz flat weighting filters with or without the notch filter. When the noise weighting filters are selected, a quasi-RMS detector is used and the level meter displays dBrn directly.
DBM Pushbutton Switch	Selects the average detector used for level measurements and the level meter displays level directly in dBm.
KHZ Pushbutton Switches	Selects either the fast or slow update rate for the frequency counter and allows the display to be blanked during noise measurements.
GENERATOR Pushbutton Switches	Selects the desired generator mode.
FREQ Control	Sets the desired frequency in continuous or 100.4 Hz stepped mode of operation.
LEVEL CONTROL	Sets the desired output level.
SEND Pushbutton Switches	Selects either 600 Ω or 900 Ω impedance and sets the dBm reference for the generator.
POWER Pushbutton Switch	Controls the power to the instrument.
MONITOR Control	Controls the level of the monitor speaker audio output.

3.4 Operation

This section describes the operation of the Model 41-01. Connections to the send and receive terminals are made in accordance with the instructions given in Section 2.0.

3.4.1 Receive Measurements

This section contains the operating instructions used for the level meter. To monitor and display the receive signal, press the display pushbutton marked DISPLAYS REC.

3.4.1.1 Receive Input Impedance

Select the receiver reference impedance by pressing either the RECEIVE 600 Ω or RECEIVE 900 Ω pushbutton. Select the terminated or bridged mode by pressing either the RECEIVE TERM or RECEIVE BRIDGE pushbutton.

3.4.1.2 Level Measurement

When the receive input impedance has been selected, press the DBM LEVEL pushbutton switch. This selects the average detector and displays level directly in dBm referenced to the selected receive input impedance.

The range of level measurement is +10.0 to -80.0 dBm. When the input is above or below this range, the display numbers will blank leaving an illuminated + sign when the input is above +10 dBm or a - sign when it is below -80 dBm.

3.4.1.3 Noise Measurements

Message circuit noise is measured by pressing either the DBRN C-MSG or DBRN 3 KHZ FLAT pushbutton. The DBRN NOTCH pushbutton may be pressed if a 995 Hz to 1025 Hz holding tone is being used for noise with tone measurements. All noise measurements are read out directly in dBrn.

The range of noise measurements is +100 to +10 dBrn. When the input is above or below this range, the display numbers will blank leaving an illuminated + sign when the input is above +100 dBrn or a - sign when it below +10 dBrn.

3.4.2 Display Selection

Either the send or receive signal level and frequency may be measured by pressing the proper DISPLAYS pushbutton. The DISPLAYS pushbuttons select the input to the level meter, frequency counter, and audio monitor. In the SEND mode, the noise weighting filters are bypassed and an absolute send level reading is displayed.

3.4.3 Frequency Measurement

The input to the frequency counter is controlled by the DISPLAYS pushbuttons. Frequency resolution and update rate are controlled by the KHZ, 1 HZ, and 10 HZ pushbuttons. In the 1 HZ mode, the resolution is 1 Hz and the update rate is 2 times per second. In the 10 HZ mode, the resolution is 10 Hz and the update rate is 10 times per second.

In the 1 HZ mode, frequencies from 40 Hz to 9.999 kHz may be measured. Frequencies above 9.999 kHz will cause the display to flash, indicating an overrange condition. The 10 HZ mode measures frequency from 40 Hz to 20 kHz. If the frequency display is all zeros when the 10 Hz or 1 Hz range has been selected, the receive input level is below approximately -45 dBm.

The KHZ OFF pushbutton is provided so that the display may be blanked, if desired, during noise measurement.

3.4.4 Audio Monitor

Input to the audio monitor is controlled by the DISPLAYS pushbuttons. The level of the audio monitor is controlled by the front panel MONITOR control.

3.4.5 Generator

This section contains the operating instructions used for the Model 41-01 generator. To measure the generator frequency and level, press the display pushbutton marked DISPLAYS SEND. Select the desired output impedance by pressing either the SEND 600 Ω or SEND 900 Ω pushbutton.

3.4.5.1 Continuous Mode

Press the generator pushbutton marked GENERATOR CONT. Use the FREQ and LEVEL controls to adjust for the desired send level and frequency as indicated on the Model 41-01 displays.

3.4.5.2 100.4 Hz Step Mode

Press the generator pushbutton marked GENERATOR STEP. The FREQ control will now adjust the output frequency in 100.4 Hz steps. With the 100.0 Hz step option, the output frequency varies in 100.0 Hz steps.

3.4.5.3 1004 Hz Fixed Frequency Mode

Press the generator pushbutton marked GENERATOR 1004 HZ. This selects the 1004 Hz test tone. The output level is adjusted using the LEVEL control.

3.4.5.4 Send Level Measurements

In accordance with telephone company transmission level measurement practices, the send level measurement is calibrated in terms of the level that will exist at the SEND terminals when they are properly terminated in the impedance selected by the SEND pushbutton switches. If the actual terminating impedance is different than the selected impedance (600 Ω or 900 Ω), send levels other than that indicated will exist at the SEND terminals. The actual level across the SEND terminals may be verified using an external meter or temporarily bridging the Model 41-01 RECEIVE terminals (in the BRIDGE mode) across the SEND terminals. The receive impedance must be the same as the send impedance.

3.4.6 Rear Panel Connections

The rear panel mounted terminal block is provided for connection of receive leads, send leads and 24 V (48 V optional) station battery. The positive terminal of the 24 V supply is connected to the chassis. Use only a floating 24 V supply or a positive ground supply.

WARNING: A reverse polarity may cause damage to the Model 41-01.

When the 24 V station battery is being used, the ac line cord must be disconnected. The front panel mounted power switch controls the ac power and it is operable when the station battery is being used.

WARNING: Connect ac power or station battery, not both. If both are connected to the unit, electrical damage will occur.

NOTES

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LIMITED WARRANTY

All Hekimian Laboratories, Inc., products are warranted against defects in materials and workmanship for a period of one year from date of delivery. HLI will repair or replace, at no cost, products which prove to be defective during the warranty period. Upon authorization by HLI, the equipment may be returned to the factory prepaid for repair. Upon completion of repair, the equipment will be returned at HLI expense. If, upon examination of the defective item, it is evident that failure was not due to defective workmanship or material, HLI will bill the purchaser for the cost of replacement or repair, including transportation charges. HEKIMIAN LABORATORIES, INC., DOES NOT WARRANT THE MERCHANTABILITY OR THE FITNESS FOR A PARTICULAR PURPOSE OF ITS PRODUCTS and does not make any warranty, expressed or implied, other than the warranty contained herein. IN NO EVENT SHALL HEKIMIAN LABORATORIES, INC., BE LIABLE FOR LOSS OF USE OF THE PRODUCT, COMMERCIAL LOSS, OR CONSEQUENTIAL DAMAGES.

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